TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	2
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	2
2.4	Flood Protection Measures	2
3.0	ENGINEERING METHODS	4
3.1	Hydrologic Analyses	4
3.2	Hydraulic Analyses	5
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	6
4.1	Flood Boundaries	6
4.2	Floodways	6
5.0	INSURANCE APPLICATION	8
5.1	Reach Determinations	8
5.2	Flood Hazard Factors	9
5.3	Flood Insurance Zones	9
5.4	Flood Insurance Rate Map Description	10

BEST COPY AVAILABLE

TABLE OF CONTENTS (Continued)

		Page
6.0	OTHER STUDIES	10
7.0	LOCATION OF DATA	10
8.0	REFERENCES AND BIBLIOGRAPHY	12

FIGURES

Figure 1 -	Vicinity Map	3
Figure 2 -	Floodway Schematic	8

TABLES

Table 1 -	Summary of Discharges	5
Table 2 -	Floodway Data	7
Table 3 -	Flood Insurance Zone Data	11

EXHIBITS

Flood Profiles

Middle Fork Panel 01P

Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map

BEST COPY AVAILABLE

FLOOD INSURANCE STUDY

CITY OF INEZ,
MARTIN COUNTY,
KENTUCKY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Inez, Martin County, Kentucky, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, FEMA, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were obtained from the Flood Insurance Study for the Unincorporated Areas of Martin County (Reference 1).

BEST COPY AVAILABLE

1.3 Coordination

On August 13, 1985, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Inez, Martin County, Kentucky. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data. Flooding caused by overflow of Middle Fork from about 630 feet upstream of its mouth to the southern corporate limits was studied by detailed methods.

Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have detailed scientific or technical data available.

2.2 Community Description

The City of Inez is located in the northern part of Martin County in eastern Kentucky and is surrounded by the unincorporated areas of Martin County. Inez is situated approximately 100 miles east of Lexington and about 40 miles south of Ashland. In 1980, the population of Inez was reported to be 415 (Reference 2).

The climate of the area is classified as humid mesothermal, characterized by considerable variation in the extremes of daily, monthly, and yearly temperature and precipitation. Seasonal variations in temperature range from an average of 37 degrees Fahrenheit (F.) in January to 76 degrees F. in July and August, with a mean temperature of about 57 degrees F. The growing season averages 6 months in length, from mid-April to mid-October. Average annual rainfall amounts to about 43.4 inches and average annual snowfall is about 18 inches.

2.3 Principal Flood Problems

Due to the parameters of this existing data study, information regarding flooding problems in the community is obtained only from the source report (Reference 1) and any other readily available sources. None of these sources provided information relating to the flood problems in the community.

2.4 Flood Protection Measures

The only flood protection measure in effect is on Rockcastle Creek near Inez. This project, completed in 1970, consists of about 2.8 miles of channel improvement, including channel widening and clearing. This project reduced the record flood of February 1972 by 3.5 feet.

BEST COPY AVAILABLE

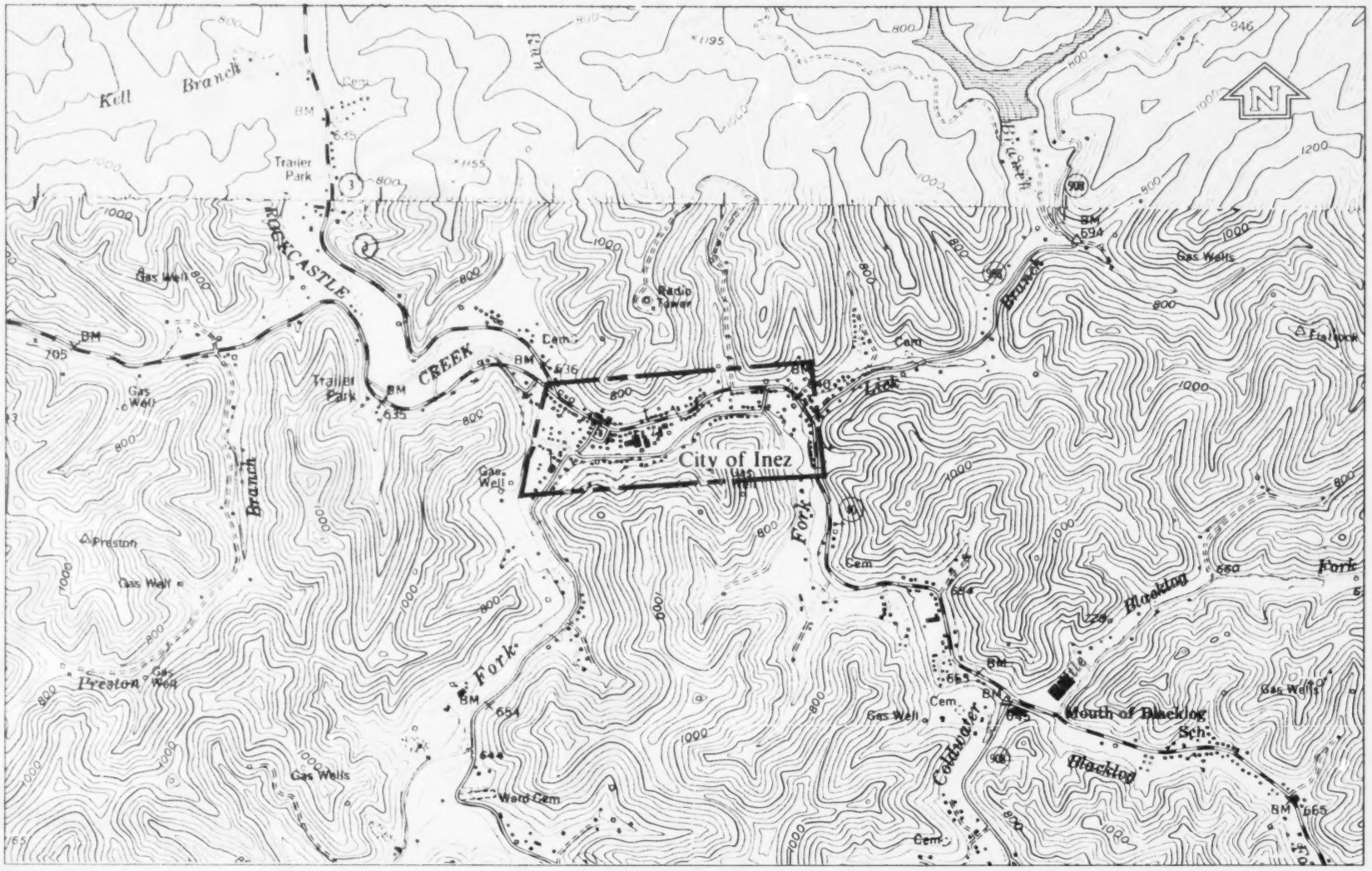


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF INEZ, KY
(MARTIN COUNTY)

APPROXIMATE SCALE
2000 0 2000 4000 6000 FEET

VICINITY MAP

BEST COPY AVAILABLE

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Natural discharge-frequency curves used in this study were previously developed for Tug Fork Basin to complete a "Special Flood Hazard Information Report" (Reference 3) prepared by the U.S. Army Corps of Engineers (COE), Huntington District. These data were updated and reanalyzed to conform to present FEMA guidelines. The curves are based on a regional analysis in accordance with the method outlined in "Statistical Methods of Hydrology" (Reference 4) and Bulletin No. 17 (Reference 5). There is a gage located in Lawrence County at Tug Fork river mile 10.1 near Glenhayes and one in Mingo County at Kermit, West Virginia, at about Tug Fork river mile 37.7. The gage at Glenhayes was installed in March 1976, and due to the short period of record, it was not in the regional analysis. The Kermit gage in Mingo County has been in question since July 1934 and most of the stage-discharge records are good.

To develop natural discharge-frequency curves for Tug Fork tributaries, 20 U.S. Geological Survey stream gaging stations in the surrounding drainage basins displaying similar hydrologic characteristics were used in the regional analysis. Periods of record range from 16 to 60 years and represent drainage areas of 31 to 3,892 square miles. An "n" value of 60 years and a generalized skew coefficient of -0.1 were adopted as being representative and were used in computing the estimated frequency for each evaluating center.

BEST COPY AVAILABLE

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MIDDLE FORK just downstream of the confluence of Saltwell Branch	33.8	3,310	5,420	6,450	9,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

The original cross sections for the computer analysis were obtained from "Strip Mapping" (Reference 6) and "Aerial Photography, Ground Control, and Orthophoto Mapping" (Reference 7).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness coefficients (Manning's "n") for water-surface computations were determined on the basis of the characteristics of historical floods in this reach and existing flood plain conditions.

The range of "n" values that were used for Middle Fork were determined by field inspection. The values were 0.045 to 0.050 in the channel and 0.060 to 0.065 in overbank areas. Starting water-surface elevations were obtained by the slope-area method. Water-surface elevations of floods of the selected recurrence intervals were developed using the COE HEC-2 step-backwater computer program (Reference 8).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been drawn.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations shown on the profiles are, thus, considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929.

BEST COPY AVAILABLE

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2400 with a contour interval of 5 feet (Reference 9).

For the streams studied by approximate methods, only the 100-year flood plain boundary was delineated using topographic maps at a scale of 1:24000 with a contour interval of 40 feet (Reference 10).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed and are presented in Table 2, Floodway Data.

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
MIDDLE FORK								
A	628	75	842	7.7	634.0	634.0	635.0	1.0
B	1082	59	713	9.0	635.3	635.3	636.1	0.8

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF INEZ, KY

(MARTIN CO.)

FLOODWAY DATA

MIDDLE FORK

BEST COPY AVAILABLE

As shown on the Flood Boundary and Floodway Map, the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and the 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown. Portions of the floodway of Middle Fork lie outside the corporate limits.

The area between the floodway and the 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

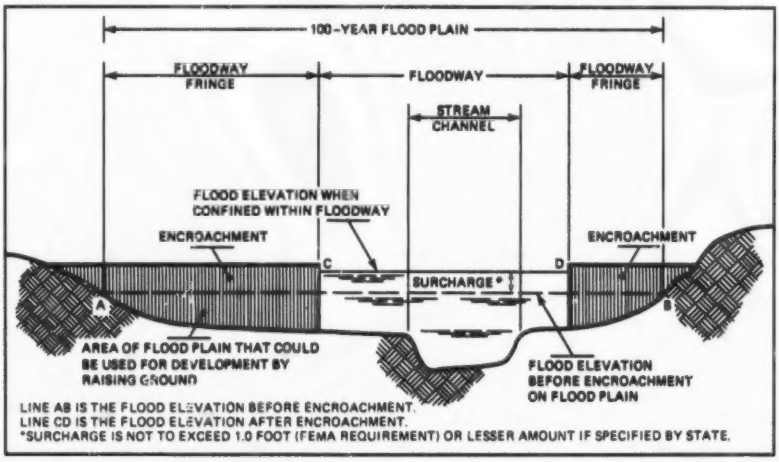

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Inez.

5.1 Reach Determinations

Reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the weighted average difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

BEST COPY AVAILABLE

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the riverine flooding sources of the City of Inez are shown on the Flood Profiles and summarized in Table 3, Flood Insurance Zone Data.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a riverine reach is the weighted average difference between the 10- and 100-year flood water-surface elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code. For example, if the difference between elevations is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.

Zone A6: Special Flood Hazard Areas inundated by the 100-year flood, with base flood elevations shown, and zones subdivided according to FHFs.

Zone B: Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- and 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and, areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

BEST COPY AVAILABLE

Zone C: Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 3, Flood Insurance Zone Data.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Inez is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines for riverine flooding sources show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

A Flood Insurance Study for the Unincorporated Areas of Martin County is in progress (Reference 1). That study is in complete agreement with this study.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

BEST COPY AVAILABLE

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
MIDDLE FORK							
REACH 1[4]	0001	−2.9	−0.7	1.5	030	A6	VARIES—SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]DATA FOR THIS REACH TAKEN FROM MARTIN COUNTY, KENTUCKY FIS

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF INEZ, KY

(MARTIN CO.)

FLOOD INSURANCE ZONE DATA

MIDDLE FORK

BEST COPY AVAILABLE

8.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Study, Martin County, Unincorporated Areas, Kentucky, in progress.

2. Kentucky Economic Statistics Department, 1980 Census Reports.

3. U.S. Army Corps of Engineers, Huntington District, Special Flood Hazard Information Report, Tug Fork of Big Sandy River, November 1978.

4. ————, Huntington District, Statistical Methods of Hydrology, Leo R. Beard, January 1962.

5. U.S. Water Resources Council, Bulletin No. 17, Guidelines for Determining Flood Flow Frequency, March 1976.

6. Henderson Aerial Surveys, Strip Mapping, July 1981.

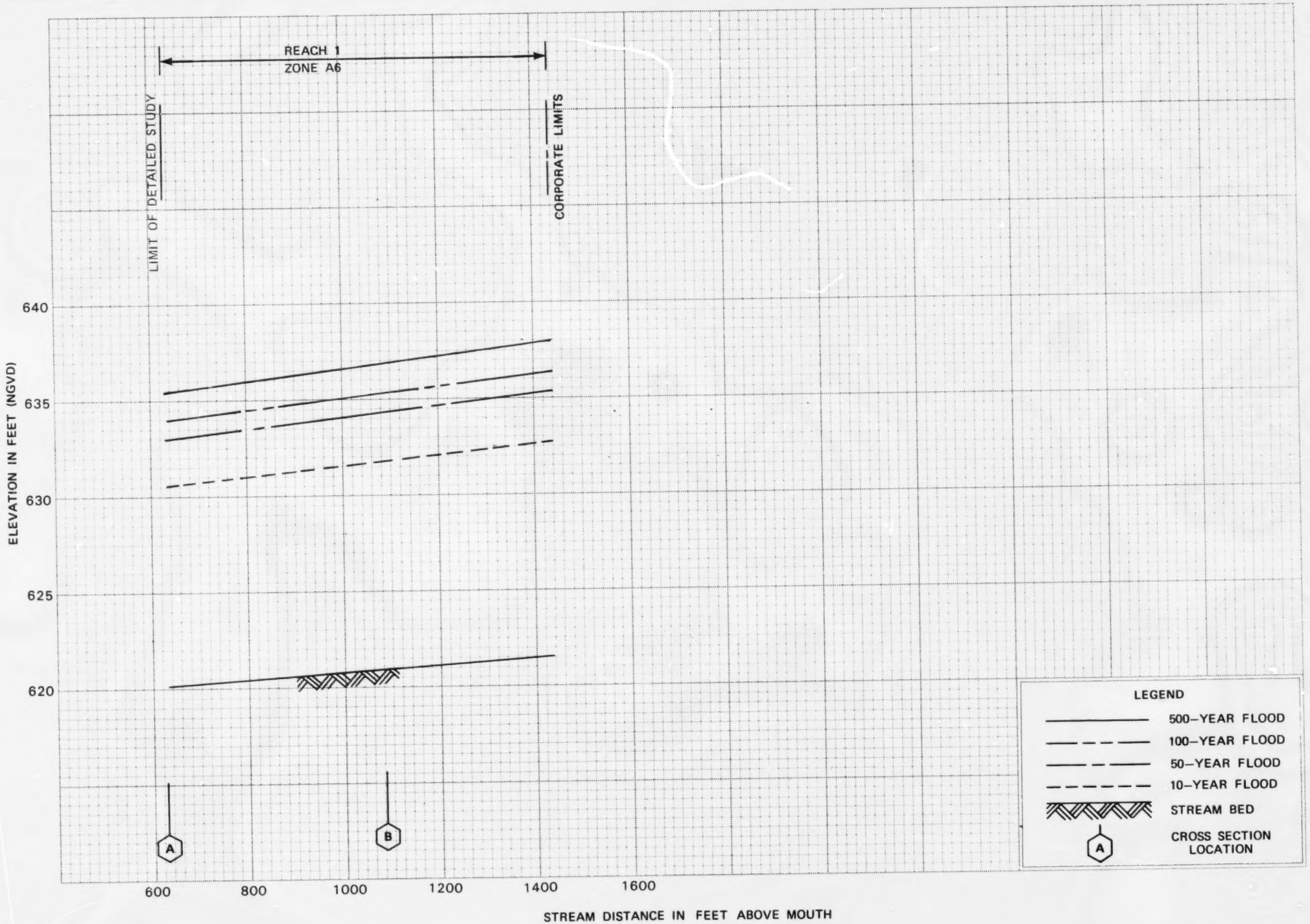
7. L. Robert Kimball Consulting Engineers, Aerial Photography, Ground Control, and Orthophoto Mapping, April 1974.

8. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, April 1984.

9. ————, Huntington District, Topographic Maps Compiled from Aerial Photographs, Scale 1:2400, Contour Interval 5 feet: Martin County, Kentucky, December 1979.

10. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 40 feet: Inez, Kentucky, 1978.

BEST COPY AVAILABLE



FLOOD PROFILES

MIDDLE FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF INEZ, KY
(MARTIN CO.)

01P

BEST COPY AVAILABLE